The accuracy is:

Scegli un'alternativa:

- a. The number of correct significant digits in approximating some quantity. ✔
- b. The number of digits with which a number is expressed.
- c. None of the above.

La risposta corretta è: The number of correct significant digits in approximating some quantity.

Given two random variables X and Y, Bayes Theorem implies that $p(y|x) = \frac{p(x|y)p(y)}{p(x)}$ where:

Scegli un'alternativa:

- a. $p(x|y)$ is called prior distribution on x.
- b. $p(x|y)$ is called posterior distribution on y.
- c. $p(x|y)$ is called likelihood on y.

La risposta corretta è: $p(x|y)$ is called likelihood on y.

Given two random variables X and Y, Bayes Theorem implies that $p(y|x) = \frac{p(x|y)p(y)}{p(x)}$ where:

Scegli un'alternativa:

- a. $p(y|x)$ is called prior distribution on x.
- b. $p(y|x)$ is called likelihood on y.
- c. $p(y|x)$ is called posterior distribution on y.

La risposta corretta è: $p(y|x)$ is called posterior distribution on y.

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 e^{x_2}$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (e^t, t)$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

- a. $h'(t) = te^t$.
- b. $h'(t) = 2e^{2t}$.
- c. $h'(t) = e^{2t}(t+1)$. ✔

La risposta corretta è: $h'(t) = e^{2t}(t+1)$.

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1^2 + x_1 x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (\sin(t), \cos(t))$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

- a. $h'(t) = \sin(2t) - \sin^2(t)$.
- b. $h'(t) = \sin(t) - \sin^2(2t)$.
- c. $h'(t) = \sin(t)\cos(t) - \sin^2(t)$. ✖

La risposta corretta è: $h'(t) = \sin(2t) - \sin^2(t)$.

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1^2 + x_2^2$, $g : \mathbb{R}^2 \to \mathbb{R}^2$, $g(x_1, x_2) = (x_2, x_1)$, then, if $h(x_1, x_2) = f(g(x_1, x_2))$:

Scegli un'alternativa:

- a. $\nabla h(x_1, x_2) = (2x_1, 2x_2)$. ✔
- b. $\nabla h(x_1, x_2) = (2x_2, 2x_1)$.
- c. $\nabla h(x_1, x_2) = (1, 1)$.

La risposta corretta è: $\nabla h(x_1, x_2) = (2x_1, 2x_2)$.

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 e^{x_2}$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, \log t)$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

- a. $h'(t) = t + 1.$
- b. $h'(t) = t^2 + 1.$
- c. $h'(t) = 2t.$

La risposta corretta è: $h'(t) = 2t$.

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1^2 + x_1 x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t^2, t)$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

- a. $h'(t) = t(2t-1)^2 + t$.
- b. $h'(t) = 4t^2 + 2t + 1$.
- c. $h'(t) = t(2t+1)^2 - 2t^2$.

La risposta corretta è: $h'(t) = t(2t+1)^2 - 2t^2$.

If $f:\mathbb{R}^2\rightarrow\mathbb{R}$, $f(x_1,x_2)=x_1^2+x_2^2$, $g:\mathbb{R}^2\rightarrow\mathbb{R}^2$, $g(x_1,x_2)=(x_1e^{x_2},x_2)$, then, if $h(x_1,x_2)=f(g(x_1,x_2))$:

Scegli un'alternativa:

- a. $\nabla h(x_1,x_2)=(2x_1e^{x_2}(e^{x_2}+x_1),2e^{x_2})$.
- b. $\nabla h(x_1,x_2)=(2x_1e^{2x_2}(e^{x_1}+x_1),2x_2)$.
- c. $\nabla h(x_1,x_2)=(2x_1e^{x_2}(e^{x_2}+x_1),2x_2)$. ✔

La risposta corretta è: $\nabla h(x_1,x_2)=(2x_1e^{x_2}(e^{x_2}+x_1),2x_2)$.

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

- a. $h'(t) = 3t^2$.
- b. $h'(t) = 3t^3$.
- c. $h'(t) = t^2$.

La risposta corretta è: $h'(t) = 3t^2$.

If

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

then:

Scegli un'alternativa:

- a. $K_2(A) = 1.$ ✔
- b. $K_2(A) = 4.$
- c. $K_2(A) = \frac{1}{2}.$

La risposta corretta è: $K_2(A) = 1.$

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

then:

Scegli un'alternativa:

- a. $K_2(A) = 4.$
- b. $K_2(A) = 2.$
- c. $K_2(A) = \frac{4}{3}.$

La risposta corretta è: $K_2(A) = 2.$

If vector $v = (10^6, 0)^T$ is approximated by vector $\tilde{v} = (999996, 1)^T$, then in $||\cdot||_2$ the relative error between v and $\tilde{v}$ is:

Scegli un'alternativa:

- a. $\sqrt{17} \cdot 10^{-6}$.
- b. None of the above.
- c. $4 \cdot 10^{-6}$. ✖

La risposta corretta è: $\sqrt{17} \cdot 10^{-6}$.

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

then:

Scegli un'alternativa:

- a. $K_2(A) = \frac{1}{2}$.
- b. $K_2(A) = 4$.
- c. $K_2(A) = 2$. ✖

La risposta corretta è: $K_2(A) = 4$.

A random variable $X : \Omega \to \mathcal{T}$ is continuous when:

Scegli un'alternativa:

- a. $\mathcal{T}$ is countable.
- b. $\mathcal{T} = \mathbb{R}$.
- c. Ω is continuous.

La risposta corretta è: $\mathcal{T} = \mathbb{R}$.

A random variable $X : \Omega \to \mathcal{T}$ is discrete when:

Scegli un'alternativa:

a. $\mathcal{T} = \mathbb{R}$.

b. Ω is countable. ✖

c. $\mathcal{T}$ is countable.

La risposta corretta è: $\mathcal{T}$ is countable.

If

$$A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$$

Then:

Scegli un'alternativa:

- a. $x = (1, 2)^T$ is an eigenvector of A.
- b. $x = (2, 1)^T$ is an eigenvector of A.
- c. $x = (0, 0)^T$ is an eigenvector of A.

La risposta corretta è: $x = (2, 1)^T$ is an eigenvector of A.

If

$$A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$$

Then:

Scegli un'alternativa:

- a. $\lambda = 5$ is the eigenvalue associated with the eigenvector $x = (2,1)^T$.
- b. $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (2,1)^T$. ✔
- c. $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (1,2)^T$.

La risposta corretta è: $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (2,1)^T$.

If

$$A = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

Then:

Scegli un'alternativa:

- a. $x = (1, 1, 0)^T$ is an eigenvector of A.
- b. $x = (0, 1, 0)^T$ is an eigenvector of A.
- c. $x = (0, -1, 1)^T$ is an eigenvector of A.

La risposta corretta è: $x = (0, 1, 0)^T$ is an eigenvector of A.

If

$$A = \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix}$$

Then:

Scegli un'alternativa:

- a. $x = (0,0)^T$ is an eigenvector of A.
- b. $x = (1,0)^T$ is an eigenvector of A.
- c. $x = (1,1)^T$ is an eigenvector of A.

La risposta corretta è: $x = (1,0)^T$ is an eigenvector of A.

If

$$A = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$$

Then:

Scegli un'alternativa:

- a. $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (1, 0)^T$.
- b. $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (0, 1)^T$.
- c. $\lambda = 1$ is the eigenvalue associated with the eigenvector $x = (1, 0)^T$.

La risposta corretta è: $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (1, 0)^T$.

If $A \in \mathbb{R}^{n \times n}, x \in \mathbb{R}^n$ and

$$Ax = \lambda x$$

For $\lambda \in \mathbb{R}$, then:

Scegli un'alternativa:

- a. For any $c \in \mathbb{R}$, $c \neq 0$, cx is an eigenvector of A.
- b. cx is an eigenvector of A if and only if $c = 1$.
- c. None of the above.

La risposta corretta è: For any $c \in \mathbb{R}$, $c \neq 0$, cx is an eigenvector of A.

If

$$A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

Then:

Scegli un'alternativa:

- a. $\lambda = 2$ is the eigenvalue associated with the eigenvector $x = (0,1,0)^T$.
- b. $\lambda = -1$ is the eigenvalue associated with the eigenvector $x = (0,0,1)^T$.
- c. $\lambda = 1$ is the eigenvalue associated with the eigenvector $x = (1,0,0)^T$. ✖

La risposta corretta è: $\lambda = -1$ is the eigenvalue associated with the eigenvector $x = (0,0,1)^T$.

In $\mathcal{F}(10, 2, -2, 2)$, if $x = \pi$, $y = e$, and $z = fl(x) - fl(y)$, then:

Scegli un'alternativa:

- a. $fl(z) = 0.43 \times 10^1$.
- b. $fl(z) = 0.44 \times 10^1$.
- c. $fl(z) = 0.40 \times 10^1$.

La risposta corretta è: $fl(z) = 0.40 \times 10^1$.

In $\mathcal{F}(10, 2, -2, 2)$, if $x = \pi$, $y = e$, and $z = fl(x) * fl(y)$, then:

Scegli un'alternativa:

- a. $fl(z) = 0.84 \times 10^1$.
- b. $fl(z) = 0.0837 \times 10^2$.
- c. $fl(z) = 0.837 \times 10^1$.

La risposta corretta è: $fl(z) = 0.84 \times 10^1$.

In $\mathcal{F}(10, 6, -3, 3)$, if $x = 192.403$, $y = 0.635782$, and $z = fl(x) + fl(y)$, then:

Scegli un'alternativa:

- a. $fl(z) = 0.193039 \times 10^3$.
- b. $fl(z) = 0.193038 \times 10^3$.
- c. $fl(z) = 0.193038782 \times 10^3$.

La risposta corretta è: $fl(z) = 0.193039 \times 10^3$.

In $\mathcal{F}(10, 2, -2, 2)$, if $x = \pi$, $y = e$, and $z = fl(x) + fl(y)$, then:

Scegli un'alternativa:

- a. $fl(z) = 0.585 \times 10^1$.
- b. $fl(z) = 0.58 \times 10^1$.
- c. $fl(z) = 0.59 \times 10^1$. ✖

La risposta corretta è: $fl(z) = 0.58 \times 10^1$.

If $f : \mathbb{R}^n \to \mathbb{R}$, $f \in \mathcal{C}^1(\mathbb{R}^n)$, then x^* is a minimum point if and only if:

Scegli un'alternativa:

- a. $\nabla f(x^*) = 0$ and $\nabla^2 f(x^*)$ is positive semi-definite.
- b. $\nabla f(x^*) = 0$.
- c. $\nabla f(x^*) = 0$ and $\nabla^2 f(x^*)$ is positive definite.

La risposta corretta è: $\nabla f(x^*) = 0$ and $\nabla^2 f(x^*)$ is positive definite.

Gradient descent methods:

Scegli un'alternativa:

- a. If α is suitable chosen, $f \in C^1$, for any x_0, always converges to a stationary point of $f(x)$.
- b. If α is suitable chosen, $f \in C^1$, for any x_0, always converges to a minimum of $f(x)$. ✖
- c. Always converges to a minimum of $f(x)$.

La risposta corretta è: If α is suitable chosen, $f \in C^1$, for any x_0, always converges to a stationary point of $f(x)$.

Gradient descent methods solves the optimization problem

$$\min_x f(x)$$

By:

Scegli un'alternativa:

- a. Generating a sequence $\{x_k\}_k$ such that, given x_0, computes $x_{k+1} = x_k - \alpha \nabla f(x_k)$ for $\alpha > 0$ step-size. ✓
- b. Generating a sequence $\{x_k\}_k$ such that, given x_0, computes $x_{k+1} = x_k + \alpha \nabla f(x_k)$ for $\alpha > 0$ step-size.
- c. Generating a sequence $\{x_k\}_k$ such that, given x_0, computes $x_{k+1} = x_k - \alpha \nabla f(x_k)$ for $\alpha \neq 0$ step-size.

La risposta corretta è: Generating a sequence $\{x_k\}_k$ such that, given x_0, computes $x_{k+1} = x_k - \alpha \nabla f(x_k)$ for $\alpha > 0$ step-size.